

PATENT

Serial No. 10/523,666

Amendment in Reply to Final Office Action mailed on November 20, 2006

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A control unit controlling a threshold voltage of a circuit unit having a plurality of transistor devices, comprising:

a reference circuit;

a measuring unit measuring a threshold voltage of at least one sensing transistor of the circuit unit and measuring a reference threshold voltage of at least one reference transistor of the reference circuit;

a differential voltage generator generating a differential voltage from outputs of the measuring unit, the voltage generator comprising an averaging unit, a comparing unit and an ~~amplifier~~, and amplifier; and

a bulk connection of the transistor devices in the circuit

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unit to which the differential voltage is fed as a biasing voltage;

wherein the averaging unit forms at least one average threshold voltage value of at least one measured transistor threshold voltage of the circuit unit;

the comparing unit compares at least one average threshold voltage value of the circuit unit with at least one measured transistor threshold voltage of the reference circuit and creating at least one difference voltage value indicating the difference between at least one average threshold voltage value of the circuit unit and at least one transistor threshold voltage of the reference circuit; and

the amplifier unit amplifies at least one difference voltage value of the comparing unit and creating at least one amplified difference voltage value.

Claim 2 (Canceled)

3. (Currently Amended) The control unit of ~~claim 2~~ claim 1, wherein the amplifier unit is a high gain amplifier.

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4.(Original) The control unit of claim 1, wherein the reference circuit comprises at least one reference transistor in at least one comparator amplifier.

5.(Original) The control unit of claim 4, wherein the reference transistor is provided in a separate well of the chip comprising the circuit unit.

6.(Original) The control unit of claim 4, wherein the reference transistor is controlled separately from the transistor devices of the circuit unit by a reference voltage.

7.(Original) The control unit of claim 1, wherein the measuring unit comprises at least one sensing transistor sensing the threshold voltage.

8.(Original) The control unit of claim 8, wherein the sensing transistor is controlled separately from the reference transistor by a sensing voltage.

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9.(Original) The control unit of claim 1, wherein the circuit unit comprises a plurality of transistor devices, and wherein a first sub-plurality of the transistor devices is employed as reference transistors and a second sub-plurality of the transistor devices is employed as sensing transistors, and wherein the differential output of the differential voltage generator is fed as a biasing voltage to the bulk of the plurality of transistor devices.

10.(Original) An integrated circuit (IC) device comprising a circuit unit and a control unit according to claim 1.

11.(Previously Presented) A method for controlling of at least one threshold voltage of transistors in a circuit unit comprising:

measuring at least one transistor threshold voltage of the circuit unit;

providing at least one reference transistor and measuring a threshold voltage of the at least one reference transistor;

generating a differential voltage from outputs of the

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measuring unit comprising the step of:

forming at least one average threshold voltage value of at least one measured transistor threshold voltage of the circuit unit;

comparing at least one average threshold voltage value of the circuit unit with at least one measured transistor threshold voltage of the reference circuit and creating at least one difference voltage representing the difference between at least one average threshold voltage value of the circuit unit and at least one transistor threshold voltage of at least one reference transistor; and

amplifying the at least one difference voltage of the comparing unit and creating at least one amplified difference voltage,

and

feeding the differential voltage as a biasing voltage to a bulk connection of the transistor devices in the circuit unit.

Claim 12 (Canceled)

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13. (Previously Presented) The method of claim 11, wherein a plurality of transistor devices is divided up into a first sub-plurality of reference transistors and a second sub-plurality of sensing transistors and wherein the transistor threshold voltage of the first sub-plurality is measured as reference voltage; the threshold voltage of the second sub-plurality is measured as sensing voltage; a differential voltage is generated from the reference voltage and the sensing voltage and wherein the differential voltage is input to the bulk of the plurality of transistor devices.

14. (Original) The method of claim 11, wherein the controlling of at least one threshold voltage of transistors in a circuit unit is done in a closed loop.

15. (Original) The method of claim 14, wherein the controlling in the closed loop includes a controlling of a power supply.

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16. (Previously Presented) The method of claim 11, wherein the amplified average voltage is negatively fed back to the circuit unit for reducing the threshold voltage difference between the circuit unit and the reference circuit.

17. (Original) The method of claim 11, wherein the threshold voltage is directly measured.

18. (New) A controller for controlling of at least one threshold voltage of transistors in a circuit unit comprising:

means for measuring at least one transistor threshold voltage of the circuit unit;

means for providing at least one reference transistor and measuring a threshold voltage of the at least one reference transistor;

means for generating a differential voltage from outputs of the measuring unit; wherein the means for generating include:

means for forming at least one average threshold voltage value of at least one measured transistor threshold voltage of the circuit unit;

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means for comparing at least one average threshold voltage value of the circuit unit with at least one measured transistor threshold voltage of the reference circuit and creating at least one difference voltage representing the difference between at least one average threshold voltage value of the circuit unit and at least one transistor threshold voltage of at least one reference transistor; and

means for amplifying the at least one difference voltage of the comparing unit and creating at least one amplified difference voltage; and

feeding the differential voltage as a biasing voltage to a bulk connection of the transistor devices in the circuit unit.

19. (New) A controller comprising:

a circuit unit including a plurality of transistors;

a reference circuit including a reference transistor having a reference voltage at a terminal;

a sensor circuit including sensors located at various regions of the circuit unit and configured to sense threshold voltages of the plurality of transistors; the sensor circuit being configured



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to average the threshold voltages to form an averaged threshold voltage, and to compare the averaged threshold voltage with the reference voltage to form a threshold voltage difference; and

a comparator configured to compare the averaged threshold voltage difference with the reference voltage;

wherein an output of the comparator is connected to a bulk connection of the circuit unit to form a control loop that changes at least one of the threshold voltages so that the averaged threshold voltage difference is zero.

20. The controller of claim 19, wherein the terminal is a gate of the reference transistor.

21. The controller of claim 19, wherein the reference circuit and the sensor circuit include a same number of transistors.

22. (New) A controller comprising:

a circuit unit including a first transistor, a reference transistor, and a bulk connection, wherein a terminal of the reference transistor has a reference voltage;

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a sensor circuit including a sensor configured to sense a threshold voltage of the first transistor and to compare the threshold voltage with the reference voltage to form a threshold voltage difference; and

a comparator configured to compare the threshold voltage difference with the reference voltage;

wherein an output of the comparator is connected to the bulk connection to form a control loop that changes at least one of the threshold voltages so that the threshold voltage difference is minimized.

23. The controller of claim 22, wherein the terminal is a gate of the reference transistor.

24. The controller of claim 22, wherein the reference circuit and the sensor circuit include a same number of transistors.